

freeze following, throughout the Basin, being quite a hard one, closed the streams abruptly.

RELATION OF THE FARMER TO THE WEATHER BUREAU.

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THE ARID FARMER.

Not more than 10 years ago practically all the dry farming carried on in this State was confined to the section of the State lying north of Salt Lake City. For a great many years dry farming had been carried on in Cache, Boxelder, and Davis counties, but until 1904 it was believed by the farmers south of Salt Lake City that the production of grain without the use of irrigation water was impracticable. About that time a study was made of the amount of precipitation in some of the counties of the State, the records of which had been made by the voluntary weather observers, working under the direction of the observer at Salt Lake City. The records at these stations showed that the precipitation at Fillmore, Millard County, was equal to the precipitation at Logan, in Cache County, the center of the dry farming area of the north, and that the precipitation in Wasatch County and Juab County was in excess of that at Logan. It was found that even some sections of Washington, Iron, and Beaver counties had an average annual precipitation equal to that of those localities where dry farming was successfully practised.

As a consequence of the accumulation of this data experiments were conducted and demonstrations carried on, showing that by properly conserving the precipitation, cereals could be produced without the use of irrigation water, and in consequence there are thousands of acres of land in this State under cultivation at the present time by dry farming methods. The reclamation of this vast area has been due, very largely, to the establishment of the observation stations by the Weather Bureau.

Since that time other stations have been located, and dry farming has been established as a successful farm practise in San Juan, Sevier, Kane, Utah, Tooele, and a number of other counties of the State. An important factor in connection with the determination as to the feasibility of dry farming in any given locality is the time at which the precipitation comes. While it is unquestionably true that success can be had, if proper methods of moisture conservation be followed independent of the time at which the precipitation occurs, yet greater success is attained when there is an ample supply of moisture during the growing months of April, May, and June. In localities where the precipitation is extremely light, if there is an assurance of ample supply of moisture during these three months, the prospects for successfully establishing dry farming are very much better.

Utah's dry farming area has developed around those centers where the Weather Bureau has already shown that there is an ample supply of moisture, and it has failed to develop in other localities where the Weather Bureau has shown that the precipitation is insufficient. There are other localities in the State where even the most venturesome has not dared to go, because there is no record of the amount of precipitation available.

The information from some of the most fertile areas of Utah, regarding the amount of precipitation, is so incomplete that the work of reclaiming these deserts is somewhat handicapped by the insufficiency of data at hand.

The chief concern of the arid farmer is to so conserve the precipitation in his soil that there will be little or no loss from evaporation. Many experiments have been made in recent years to determine the maximum and minimum amounts of water necessary for the production of vegetable organic matter. A problem the arid farmer has to solve—and this is also true of

the man who is growing crops by irrigation—is the determination of the conditions under which the maximum amount of vegetable substances of best quality may be reproduced with a minimum amount of water. As a result of these experiments, it has been determined that cultivation of the soil largely reduces the evaporation of water, and the more cultivation received by the plant the less amount of water transpires from the plant in the production of a pound of dry matter. A number of other determining factors have been discovered. For example, it has been shown that shade diminishes greatly the evaporation of water from the soil, and that increasing the saturation of the soil increases in a somewhat larger ratio the yields of dry matter from that soil, and that approximately the same amount of water is required under various conditions of soil saturations for the production of a pound of dry matter. It has been found that fertile soils will produce crops with a much smaller amount of water than will infertile soils. The number of pounds of water required for the production of a pound of dry matter varies greatly with the crop, the soil, the season, and the method of cultivation practised, and the amount of water required for the production of plants is very much higher in our arid climate than in the humid sections.

In all of these questions the Weather Bureau, in ascertaining the necessary data in relation to the amount of precipitation, the velocity of the wind, and the number of days of sunshine, has a wonderful field, and it is a great pleasure to know that the Weather Bureau is greatly interested in establishing such data.

The writer regards the establishment of the Weather Bureau stations as fundamental to any locality where farming is to be practised, and particularly desirable in those localities where dry farming methods are to be relied upon entirely.

THE FRUIT GROWER.

Successful fruit growing in this State will depend largely upon the information furnished by the United States Weather Bureau.

Fortunately for the fruit grower, methods have been discovered whereby a greater part of the loss to the fruit crop from frost and freezing weather can be avoided. Recent experiments in orchard heating in Colorado have demonstrated that a safe temperature can be maintained when the thermometer goes down to 20° above zero, or even lower. The application of this discovery means that there is to be a revolution in the fruit-growing industry through the entire west. It means that the successful fruit grower will equip his orchard with apparatus to protect him from spring frosts.

In this work the Weather Bureau will have a very important part to play, since a warning will be sent out as to when frosts may be expected, and the fruit grower, relying upon this warning, will be enabled to adopt such methods as will result in saving the crop. The records from those stations where orchard heating has been most successful show that frosts are insidious in most cases, but the possibility of their coming can generally be forecast by the Weather Bureau. In the fruit-growing belts it will be necessary for a telephone to be installed on every fruit farm, and by cooperation with the Weather Bureau, the changes in the thermometer and general trend of air currents may be easily ascertained. Warnings can be sent out by the Weather Bureau, fires directed started in the orchards, and the crop can be saved.

THE IRRIGATION FARMER.

Utah has an area of 54,000,000 acres of land. Of this amount 20,000,000 acres are taken up by mountains and lakes. There are 12,000,000 acres of coal, salt, and mineral lands, leaving 22,000,000 acres of land subject to cultivation. If this land is ever put under cultivation most of it will have to be done by dry farming methods. There still remains, however, a considerable acreage of the most valuable land to be farmed by irrigation.

In determining the feasibility of any irrigation project, the work of the Weather Bureau plays a very important part. The average amount of precipitation in any given locality should be the determining factor as to whether the water in any of the rivers will be sufficient to warrant the construction of reservoirs and canals. It is generally understood that during the past few years the precipitation in this State has been abnormal, but if the data furnished by the Weather Bureau and extending over a number of years is examined and the facts warrant the construction of an irrigation system it may be safely proceeded with. Any other course might prove disastrous.

CONCLUSION.

The writer regards the establishment and maintenance of properly equipped Weather Bureau stations in various localities of the State as being a matter of prime and vital importance. The growth of the agricultural interests of the State is very closely connected with the results and facts determined by these stations, and they should be encouraged by the farmers, and such representation should be made to our Congressional delegation as would convince them of the necessity of establishing a great many more stations than are now in existence.